AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A method for estimating a location of a moving object in a navigation system, comprising ~~the steps of~~:

(a) receiving GPS (Global Positioning System) location data from a moving object;

(b) determining if the moving object has entered a GPS shadow area by using the received GPS location data, said GPS shadow area corresponding to an area where received GPS location data is unreliable;

(c) calculating a moving straight distance of the moving object with reference to a last GPS location data in a visible ~~regions~~ region when the moving object is in a GPS shadow area;

(d) calculating a virtual location data by using the calculated moving straight distance of the moving object; and

(e) calculating an estimated location on a digital numeric map positioned nearest from the virtual location data, and performing a map-matching to provide a navigation service,

wherein the step (c) calculates the moving straight distance based on a non-GPS velocity of the moving object and an estimation unit time period.

2. (Currently Amended) The method according to claim 1, wherein the step (b) comprises ~~the steps of~~:

(b-1) calculating an identifying value on a reliability of the GPS location data by using GPS location data from a plurality of GPS satellite;

(b-2) comparing the calculated identifying value with a set value; and

(b-3) if the identifying value is greater than or equal to the set value, determining that the GPS location data is unreliable and thus the location of the moving object is in the shadow area, and if the identifying value is less than the set value, determining that the GPS location data is reliable and thus the location of the moving object is in the visible region ~~when~~.

3. (Currently Amended) The method according to claim 2, wherein in the step (b-1), the identifying value of the reliability of the GPS location data is a horizontal dilution of precision (HDOP) value.

4. (Currently Amended) The method according to claim 2, wherein in the sep (b-3), the location of the moving object is estimated using the GPS location data or a dead reckoning technique when the location of the moving object is determined to be in the visible region ~~by using GPS location data~~.

5. (Currently Amended) The method according to claim 1, wherein in the step (e), the virtual location data is calculated using a reference point of any one of the last GPS location data in the GPS visible region and the estimated location data of the moving object in the shadow area, the calculated moving straight distance, and a due north reference angle between ~~the moving straight line and link~~ due north and a link positioned along the moving straight distance.

6. (Currently Amended) The method according to claim 1, wherein in the step (e), coordinates (longitude, latitude) of the virtual location data are obtained by:

longitude = longitude of a previous map-matching location + ~~speed~~ the velocity of the moving object * cos (an attitude angle of the previous map-matching location) * time (sec), and

latitude = latitude of the previous map-matching location + ~~speed~~ the velocity of the moving object * sin (the attitude angle of previous map-matching location) * time (sec).

7. (Currently Amended) The method according to claim 5, wherein the due north reference angle of the link is a link due north reference angle positioned on an extended ~~of~~ traveling direction with reference to the previous map-matching location data of GPS location data.

8. (Currently Amended) The method according to claim 5, further comprising ~~the step of~~:

(f) after the step (e), if the estimated location of the moving object is ~~map-matching~~ map-matched onto the digital numeric map, obtaining a next virtual location data of the moving object by using the calculated moving straight distance of the moving object and the due north reference angle of the corresponding link with reference to the map-matching location, and calculating a next estimated location by map-matching the next virtual location data onto a shortest distance of the digital numeric map.

9. (Currently Amended) A method for estimating a location of a moving object in a navigation system, comprising ~~the steps of~~:

(a) receiving GPS (Global Positioning System) location data;

(b) determining if the moving object has entered a GPS shadow area by using the received GPS location data, said GPS shadow area corresponding to an area where received GPS location data is unreliable;

(c) obtaining a map-matching value of a last GPS location data in a visible ~~regions~~ region when the moving object is in a GPS shadow area, and calculating a moving straight distance of the moving object with reference to the map-matching value;

(d) detecting interpolated points and ~~link of location estimated~~ corresponding links linking the interpolated points using the calculated moving straight distance of the moving object;

(e) ascertaining ~~whether~~ which link the moving object is on ~~the detected link~~; and

(f) estimating a moving location by using ~~distance~~ a length of the ~~link,~~ link the moving object is on, coordinates of the interpolated ~~point~~ points, and a ~~speed~~ velocity of the moving object ~~and length of the link if the moving object is on the detected link~~

wherein the step (c) calculates the moving straight distance based on a non-GPS velocity of the moving object and an estimation unit time period.

10. (Currently Amended) The method according to claim 9, wherein in the step (d), the ~~link in traveling direction~~ links and the interpolated points ~~connected to the link~~ are detected on a

digital numeric map ~~by using moving straight distance calculated using speed and time of the moving object and previous last map-matching location data.~~

11. (Currently Amended) ~~The method according to claim 9~~, A method for estimating a location of a moving object in a navigation system, comprising:

(a) receiving GPS (Global Positioning System) location data;

(b) determining if the moving object has entered a GPS shadow area by using the received GPS location data, said GPS shadow area corresponding to an area where received GPS location data is unreliable;

(c) obtaining a map-matching value of a last GPS location data in a visible region when the moving object is in a GPS shadow area, and calculating a moving straight distance of the moving object with reference to the map-matching value;

(d) detecting interpolated points and corresponding links linking the interpolated points using the calculated moving straight distance of the moving object;

(e) ascertaining which link the moving object is on; and

(f) estimating a moving location by using a length of the link the moving object is on, coordinates of the interpolated points, and a velocity of the moving object,

wherein the step (e) comprises ~~the steps of~~:

(e-1) calculating a first residue distance of a first link by using a distance to a next interpolated ~~points~~ point from the last map-matching ~~reference~~ value;

(e-2) comparing the first residue distance of the first link with the calculated moving straight distance ~~of the moving object if the residue distance of the link is calculated~~, determining

that the moving object is on the ~~corresponding~~ first link if the first residue distance of the first link is greater than or equal to the calculated moving straight distance ~~of the moving object~~, and determining that the moving object is on ~~another~~ a second link if the calculated moving straight distance ~~of the moving object~~ is greater than the first residue distance of the first link; and

(e-3) if the moving object is determined to be on ~~another~~ the second link, subtracting ~~the~~ a second residue distance of the second link from the calculated moving straight distance ~~of the moving object~~, comparing the ~~subtracted~~ second residue ~~moving straight~~ distance with a distance of ~~another~~ a third link, and determining whether the moving object is on ~~another~~ the third link.

12. (Currently Amended) The method according to claim 9, wherein a next location of the moving object in the shadow area is estimated using the calculated moving straight distance ~~(or~~ or residue moving straight ~~distance)~~ distance of the moving object, coordinates of interpolated points connecting ~~the~~ a corresponding link on the digital numeric map, a length of the corresponding link, and a due north reference angle of the corresponding link.

13. (Currently Amended) The method according to claim 12, wherein the location ~~data~~ of the moving object in the shadow area ~~are~~ is obtained by:

longitude = longitude of a previous interpolated point + ~~speed~~ the velocity of the moving object * cos (an estimated direction of the link) * time (sec), and

latitude = latitude of the previous interpolated point + ~~speed~~ the velocity of the moving object * sin (the estimated direction of the link) * time (sec),

where, the estimated direction of the link is the due north reference angle of the link.

14. (Currently Amended) The method according to claim 12, wherein the location ~~data~~ (longitude, latitude) of the moving object in the shadow area ~~can be~~ is calculated using ~~speed and time of the moving object~~ the non-GPS velocity of the moving object and the estimation unit time period, an estimated direction of ~~the~~ a corresponding link, and coordinates (longitude, latitude) of ~~post~~ interpolated ~~point~~ points on the corresponding link.